

GREECE

By Harold R. Newman

The mineral industry, comprising the mining, industrial minerals, and metal processing sectors, was a small but important part of the national economy and was highly concentrated. About 60% of the industry's production was handled by five mining companies. Bauxite was the most important Greek mineral commodity. Other important commodities were chromite, gold, iron, lead, nickel, and zinc. Aluminum was produced from domestic sources of bauxite and alumina and was important in the domestically integrated metals sector. The steel produced was mostly from imported scrap (table 1). Greece was the largest producer of bauxite, magnesium, nickel, and perlite in the European Union (EU).

The industrial minerals sector was more important in the national economy than the metal sector and accounted for 14% of gross domestic product (GDP). The mining sector accounted for about 1% of the GDP. Production of mineral commodities in Greece was closely tied to the export market. Exports of such minerals as bauxite, bentonite, nickel, and perlite made up a major share of total revenues. About 50% of the country's minerals were being exported. There was a minerals surplus trade balance as more minerals were exported than imported. In 2000, the more important commodities were bentonite, magnesite, and perlite. Privatization efforts were continuing in the magnesite and refractories industries (U.S. Department of State, July 2000, Greece—FY 2000 country commercial guide, accessed March 13, 2001, at URL http://www.state.gov/www/about_state/business/com_guides/2000/europe/greece_CCG2000.pdf). During the long term, the significance of the minerals industry was slowly lessening.

Because northern Greece was thought to contain a significant amount of exploitable mineral resources, it received more attention in exploration activities. In 2000, most activities were directed towards gold. Only a few foreign companies had invested in Greek mines. These companies included TVX Hellas S.A. (an affiliate of TVX Gold Inc. of Canada), which bought the Cassandra Mines (the Olympias and the Stratonis deposits); United Kingdom-based Microfine S.A., which operated mines that extracted a rare material called hundite, unique for its flame-retardant properties; and the German-based Otavi Minen Hellas S.A., which operated perlite mines. Selected Greek companies with major equity owners are listed in table 2.

Environmental concerns were the responsibility of the Ministry of Environment, Town Planning, and Public Works. The Government took an active role in environmental protection. The general laws enacted by the Government included Law 1360/76 (Siting Arrangement and Environment), Presidential Executive Order 1180/81, and Law 1650/86 (Environmental Protection), which together formed the basis of the active legislative framework. To comply with EU Order

88/609 concerning emission limitations, the Government executed Ministry Decision 58751/2370/15.4.93, which included the limits of the main pollutants from electric powerplants.

Aluminium de Grèce S.A. (a subsidiary of Pechiney of France), which was the only producer of primary aluminum in Greece, completed parts of a \$64.3 million investment plan that began in 1996. The program will allow for the decrease of production costs by 20% and will result in increased productivity. The company produces and processes aluminum and profiles, alumina, and bauxite and manufactures related items (Aluminium de Grèce S.A., March 21, 2000, Company summary, accessed February 14, 2001, at URL <http://profiles.wisi.com/profiles/scripts/corpinfo.asp?CUSIP=C30021900.htm>).

Bauxite mining and processing continued into 2000. Silver & Baryte Ores Mining Co. S.A.'s (S&B) operations, which were formerly owned by Bauxites Parnasse Mining Co. S.A., continued in the Itea area, with most of the production exported. S&B's bauxite deposits are of karst-Mediterranean type and consist of three bauxite horizons. The upper diaspore horizon and the middle boehmite horizon were mined by both open pit and underground methods. Run-of-mine bauxite was transported 30 kilometers (km) to the plant where it was crushed, screened, sorted, and blended to meet the specific needs of customers. Delphi-Distomon S.A. continued to produce bauxite, which was sold to Aluminium de Grèce S.A.'s operation at Distomon (Industrial Minerals, 2001b).

Eleusis Bauxite Mines S.A. (Elbaumin) had produced bauxite from two mines in Lamia. Elbaumin's assets, however, were sold to private interests; it was unclear whether they would continue with bauxite production (Industrial Minerals, 2001a).

The Cassandra Mines have produced lead, silver, and zinc for more than 30 years. The mines were bought in 1996 by TVX Hellas to exploit the refractory gold ores by incorporating pressure oxidation technology into the ore-processing phase.

TVX reported that its environmental impact study had been approved for the Olympias project. The project planned to produce 7600 kilograms per year (kg/yr) of gold in doré, 69,000 kg/yr of silver, 22,500 metric tons per year (t/yr) of lead, and 21,500 t/yr of zinc (Mining Journal, 2000d). Estimated proven and probable resources were 127.2 metric tons. The mine, costing an estimated \$248 million, was expected to begin production in 2003 and have an 18-year life (Mining Engineering, 2000). The Greek Ministry of Environment, Town Planning, and Public Works turned down the environmental impact statement (EIS) of Midas SA, which held a gold exploration licence on the island of Milos. The rejection effectively precludes further exploration. The company has requested a review and a full explanation noting that an

identical EIS that covered the same area on Milos and submitted by Midas in July 1999 was approved by the same department of the Ministry. Resources at the Milos project were estimated to be 8.6 million metric tons (Mt) at a grade of 2.4 grams per metric ton (g/t) of gold (Mining Journal, 2000a).

Normandy Mining Ltd. of Australia announced that, as part of refocusing on gold, it had acquired a further 13.33% interest in the Perama gold project from S&B. In 2000, Normandy owned 80% of the project, and S&B retained 20%. The project had an estimated 11 Mt at a grade of 3.8 g/t of gold. Initial production was scheduled for early 2002 (Mining Journal, 2000c).

In 2000, General Mining & Metallurgical Co. S.A. (Larco) restarted some of its idle nickel production capacity. The plant ran at about two-thirds capacity in 1999 owing to the low price of nickel. Larco was considering raising output to its normal production capacity of about 18,000 t/yr (Mining Journal, 2000b).

As part of a \$75 million modernization that began in 1998, Sidenor S.A. was close to full production at its plant in Thessaloniki. The goal was to have the plant producing around 530,000 t/yr by 2001. Narrow strip production was underway, and other parts of the project were continuing. Upgrades were being made to a 600,000 t/yr melting shop that was scheduled to be commissioned by mid-2001 (Metal Bulletin, 2000).

In the industrial minerals sector, Hellenic Mineral Mining Co. S.A. continued asbestos mining operations at the mines at Zidani near Kozani. Most of the various grades of asbestos fibers produced were exported. The fibers are suitable for mixed applications, such as asbestos-cement pipes and roofing applications.

Greece was the second largest world producer of bentonite after the United States. Bentonite is extracted from Milos by open pit mining. Mykobar Mining Co. S.A. and S&B are the major producers and accounted for almost all Greek bentonite production. Mykobar's operation has the capacity to produce more than 200,000 t/yr, while S&B operates a 600,000-t/yr-capacity facility. Major applications were iron ore pelletizing, drilling mud, civil engineering applications, foundry applications, and cat litter.

The Greek Competition Committee approved the acquisition of a controlling interest in Heracles General Cement Co. S.A. (54.48%) and Halkis Cement S.A. (72.65%) by Blue Circle Industries plc of the United Kingdom. Heracles is the largest cement company in Greece, with two modern plants and a market share of 40%; Halkis Cement has one plant and a market share of 12.5%. This \$575 million deal made Blue Circle the premier cement producer in Greece and a strong player in the southeastern Mediterranean region (Blue Circle Industries plc, April 25, 2000, Greek Competition Committee approves Blue Circle's acquisition of controlling interest in Heracles and Halkis Cement, accessed December 20, 2000, at URL http://www.bluecircle.co.uk/html/corp/2000_013.html).

Lava Mining & Quarrying Co. S.A. specialized in industrial minerals with production of gypsum from the island of Crete, pozzolan from the island of Milos, and pumice from the island of Yali.

Grecian Magnesite S.A. was a leading magnesite producer in the Western World, with its open pit mine at Yerakini in

northern Greece. After being mined, the material was processed, beneficiated, and fed into rotary or shaft kilns for conversion to caustic or dead-burned magnesite.

In 2000, the Greek marble industry continued to play a leading role in the international dimension stone market as a result of the existence of marble production in almost all areas of the country, the variety of uses, and the range of colors (ash, black, brown, green, pink, red, and multicolored). The marble industry was active in the quarrying, processing, and selling blocks and finished products.

S&B continued production of natural zeolite in northern Greece. The operation produces five grain sizes of clinoptilolite, which has a high cation-exchange capacity owing to its honeycomb crystalline structure.

The Public Power Corporation (PPC) was the major producer of lignite, which was the predominant fuel in electricity generation in Greece. Most PPC lignite is produced from the Ptolemais-Amyntaion Basin with lesser amounts from the Megalopolis Basin. Lignite reserves were estimated to be 2,900 Mt (U.S. Energy Information Administration, August 2000, Greece—Country analysis brief, accessed November 8, 2000, at URL <http://www.eia.doe.gov/emeu/cabs/greece.htm>).

Hellenic Petroleum SA, which was the state-controlled energy corporation, started construction of a 230-kilometer pipeline to a refinery it has acquired in Skopje, Macedonia. The \$100 million pipeline, due to be completed by mid-2001, was the first big infrastructure project to get underway in the Balkans since the end of the Kosovo conflict. The pipeline would have the capacity to carry 2.5 million metric tons per year of crude oil from a storage depot in Thessaloniki to the Okta refinery outside Skopje (FT.com, July 31, 2000, Greece starts 230 km pipeline, accessed August 1, 2000, via URL <http://news.ft.com>).

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Major Source of Information

Institute of Geology and Mineral Exploration
70 Messoghion St.
11527 Athens, Greece
Ministry of Development
Directorate of Raw Materials Mineral Policy, Section A
80 Michalakopoulou St.
10192 Athens, Greece

TABLE 1
GREECE: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity 3/ METALS	1996	1997	1998	1999	2000 e/
Aluminum:					
Bauxite	2,451,734	1,876,600	1,823,000	1,882,505 r/	1,990,500 4/
Alumina, Al ₂ O ₃	601,580	615,700	625,000 e/	625,590 r/	667,141 4/
Metal:					
Primary	141,295	132,600	145,900	170,301 r/	167,507 4/
Secondary e/	3,000	3,000	3,000	3,000	3,000
Chromite, run-of-mine e/	11,725 4/	12,000	12,000	12,000	12,000
Iron and steel:					
Iron ore and concentrate, nickeliferous:					
Fe content e/	810,000 r/	700,000	700,000	600,000	575,000
Ni content	21,600 r/	18,419 r/	16,985 r/	16,050 r/	19,535 4/
Metal:					
Steel, crude	950,000 e/	1,016,000	1,109,000	951,000 r/	1,088,000 4/
Ferroalloys, ferronickel, gross weight	71,204 4/	70,440 r/	60,020 r/	59,545 r/	81,662 4/
Ni content	17,825 r/	17,600 r/	15,005 r/	12,964 r/	17,470 4/
Lead, mine output, Pb content e/	11,541 4/	19,300	18,000	22,001 r/	18,235 4/
Manganese:					
Ore, crude: e/					
Gross weight	11,000	12,067 4/	10,000	990 r/	10,000
Mn content	2,572 4/	2,600	2,500	353 r/	350
Concentrate:					
Gross weight e/	3,000	2,910	2,910 e/	345 r/	350
Mn content	1,443 4/	1,440 r/	1,440 r/	149 r/	150
Nickel, metal, Ni content of ferronickel	17,801	17,610	15,005	13,462 r/	17,125 4/
Silver, mine output, Ag content kilograms	16,600 4/	45,000 e/	45,000	45,771 r/	37,145 4/
Tin, metal, secondary e/	100 r/	150	200	-- r/	-- 4/
Zinc, mine output, Zn content by analysis	13,602	17,800 e/	29,100	19,619 r/	20,336 4/
INDUSTRIAL MINERALS					
Asbestos: e/					
Ore	4,862,799 4/	4,038,076 4/	4,000,000	-- r/	-- 4/
Processed, fibers	80,213 4/	63,294 4/	70,000 r/	-- r/	-- 4/
Barite:					
Ore, crude	671	905	800 e/	500 e/	500
Concentrate	530	742	600 e/	367 r/	300
Cement, hydraulic e/ thousand tons	14,700 r/	14,982 4/	15,000	14,000	14,500
Clays:					
Bentonite:					
Crude	973,517	942,555	950,000 e/	1,049,657 r/	1,150,000
Processed	764,578	572,718	750,000 e/	186,716 r/	200,000
Kaolin: e/					
Crude	60,453 4/	60,000 4/	60,000	64,931 4/	65,000
Processed	300	300	300	300	300
Feldspar e/	60,000	65,000	65,000	78,500 4/	95,000
Gypsum and anhydrite	546,344	662,640	600,000 e/	686,416 r/	750,000
Magnesite:					
Crude	682,346	623,050	650,000 e/	495,144 r/	500,000
Dead-burned	57,438	86,260	70,000 e/	39,965 r/	45,000
Caustic-calcined	120,072	116,775	125,000 e/	117,817 r/	120,000
Huntite, crude e/	13,000	19,422 4/	18,000	18,000	18,000
Nitrogen, N content of ammonia	90,400	82,700 e/	177,600 r/	119,697 r/	121,200 4/
Perlite:					
Crude	598,640	695,917	600,000	777,898 r/	600,000
Screened	417,882	500,714	500,000	435,431 r/	360,000
Pozzolan (Santorin earth)	745,790	766,750	750,000	934,933 r/	950,000
Pumice	867,450	841,646	850,000	885,000 r/	860,000
Salt, all types e/	147,239 4/	150,000	150,000	176,867 4/	180,000
Silica	86,600	95,730	90,000	126,000 r/	125,000

See footnotes at end of table.

TABLE 1--Continued
GREECE: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity 3/	1996	1997	1998	1999	2000 e/
INDUSTRIAL MINERALS--Continued					
Sodium compounds: e/					
Carbonate	750	750	750	750	750
Sulfate	6,000	6,000	5,000	5,000	5,000
Stone:					
Dolomite	23,000	90,000 e/	90,000	90,000	90,000
Marble	196,669	200,000 e/	200,000	178,199 r/	200,000
Flysch	85,138	90,000 e/	80,000	80,000	80,000
Quartz, processed	6,350	7,500 e/	6,500	6,500	6,500
Sulfur: e/					
S content of pyrites	9,660 4/	10,000	9,500	9,500	9,600
Byproduct of natural gas	105,000	52,000	55,000	55,000	60,000
Byproduct of petroleum	10,000	7,600	7,500	7,500	8,000
Total	125,000	69,600	72,500	72,000	77,600
Zeolite e/	2,000	3,000	4,000	3,000	3,000
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Lignite	59,738	56,375 r/	60,400	61,861 r/	65,000
Lignite briquets e/	50,000	50,000	50,000	34,000 r/	34,000
Coke, gashouse e/	15,000	15,000	14,000	-- r/	--
Gas:					
Manufactured, gasworks e/	15	15	15	15	15
Natural	38	43	40 e/	21 r/	36
Natural gas plant liquids e/	350	350	350	350	350
Petroleum: e/					
Crude	3,738 4/	3,380 4/	3,400	3,400	1,792 4/
Refinery products:					
Liquefied petroleum gas	5,000	5,000	5,000	6,415 r/	8,886 4/
Gasoline	30,000	30,000	30,000	27,243 r/	31,943 4/
Naphtha	4,500	4,500	4,500	7,480 r/	8,806 4/
Mineral jelly and wax	15	15	15	14 r/	28 4/
Jet fuel	12,000	12,000	12,000	15,152 r/	16,696 4/
Kerosene	150	150	150	62 r/	70 4/
Distillate fuel oil	26,000	26,000	26,000	36,300 r/	42,127 4/
Refinery gas	2,000	2,000	2,000	2,891 r/	3,416 4/
Lubricants	1,000	1,000	1,000	1,239 r/	1,120 4/
Residual fuel oil	36,000	36,000	36,000	41,532 r/	50,017 4/
Bitumen	1,500	1,500	1,500	2,491 r/	3,133 4/
Petroleum coke	500	500	500	721 r/	897 4/
Other	400	400	400	154 r/	462 4/
Refinery fuel and losses	5,500	5,500	5,500	5,922 r/	7,126 4/
Total	125,000	125,000	125,000	147,621 r/	174,727 4/

e/ Estimated. r/ Revised.

1/ Estimated data are rounded to no more than three significant digits; may not add to totals shown.

2/ Table includes data available through July 2001.

3/ In addition to the commodities listed, other crude construction materials are produced, but no basis exists to estimate production.

4/ Reported figure.

TABLE 2
GREECE: STRUCTURE OF THE MINERAL INDUSTRY IN 2000

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Alumina	Aluminium de Grèce S.A. (Pechiney of France, 60%)	Distomon, in Boeotia	640
Aluminum	do.	do.	150
Asbestos	Hellenic Mineral Mining Co. S.A.	Mines at Zidani, near Kozani	100
Barite, BaSO ₄	Silver & Baryte Ores Mining Co. S.A. (Eliopoulos-Kyriacopoulos Group)	Milos Island	1
Bauxite	do.	Mines at Fokis, plants at Fokis and Itea	2,000
Do.	Eleusis Bauxites Mines, S.A. (ELBAUMIN)	Mines near Drama, Itea, and Fthiotis-Fokis Plants in Aghia Marina, Drama, and Itea	300 400
Do.	Delphi-Distomon S.A.; Hellenic Bauxites of Distomon S.A. (Aluminium de Grèce S.A.)	Open cast mines at Delphi-Distomon area	500
Bentonite:			
Crude	Mediterranean Bentonite Co. S.A. (Industria Chimica Mineraria S.p.A., Italy)	Surface mines on Milos Island	20
Do.	Mykobar Mining Co. S.A. (Silver & Baryte Ores Mining Co. S.A.)	Mines at Adamas, Milos Island Plants at Adamas, Milos Island	180 150
Do.	Silver & Baryte Ores Mining Co. S.A. (Eliopoulos-Kyriacopoulos Group)	Mines at Adamas, Milos Island	500
Processed	do.	Plant at Vouidia Bay, Milos Island	400
Cement	Halkis Cement Co. S.A. (Blue Circle Industries Plc., 72.65%)	Micro-Vathi plant, west-central Euboea Island	3,000
Do.	Halyps Cement S.A. (Ciments Français, France)	Paralia Aspropyrgos plant, Athens	800
Do.	Heracles General Cement Co. S.A. (Blue Circle Industries Plc., 54.48%)	Plant at Milaki Plant at Volos	1,900 4,600
Do.	Titan Cement Co. S.A.	Elefsis plant, Athens Kamari plant, Boeotia Patras plant, northern Peloponnesus Thessaloniki plant, Thessaloniki	400 2,600 1,900 1,650
Chromite	Financial-Mining-Industrial and Shipping Corp. (FIMISCO) (IRO)	Tsingeli Mines and plant near Volos	25
Ferroalloys, Ni content of ferronickel	General Mining & Metallurgical Co. S.A. (Larco) (IRO)	Larymna metallurgical plant	25
Gold, Au in concentrate	TVX Hellas (TVX Gold Inc., Canada)	Kassandra Mines, Olympias	25
Gypsum	Lava Mining & Quarrying Co. S.A.	Altsi deposit, Crete Island	250
Do.	Titan Cement Co. S.A.		280
Lead, mine, Pb in concentrate	TVX Hellas (TVX Gold Inc., Canada)	Kassandra Mines (Olympias, Stratoni) northeastern Chalkidiki	
Lignite	Public Power Corporation (Government)	Aliveri Mine, Euboea Island Megalopolis Mine, central Peloponnesus Ptolemais Mine, near Kozani	420 7,000 28,000
Manganese, battery-grade MnO ₂	Eleusis Bauxite Mines Mining, Industrial and Shipping S.A. (National Bank of Greece)	Nevrokopi, Drama	10
Magnesite, concentrate	Viomagn-Fimisco Ltd. (Violignit S.A., 65%; Alpha Ventures, 35%)	Mines at Gerorema, Kakavos, and Mantoudhi, northern Euboea Island	250
Do.	Grecian Magnesite S.A.	Mine and plant at Yerakini, Chalkidiki	200
Natural gas	million cubic meters per day Public Petroleum Corporation (Government)	Prinos offshore gasfield and oilfield, east of Thasos Island	125
Nickel, ore	General Mining & Metallurgical Co. S.A. (Larco) (IRO)	Agios Ioannis Mines near Larymna Mines on Euboea Island	500 2,500

TABLE 2--Continued
GREECE: STRUCTURE OF THE MINERAL INDUSTRY IN 1998

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Perlite		Silver & Baryte Ores Mining Co. S.A. (Eliopoulos-Kyriacopoulos Group)	Mines on Kos and Milos Islands; plant at Pireaus	300
Do.		Otavi Minen Hellas S.A. (Otavi Minen AG, Germany)	Milos Island	150
Do.		Bouras Co.	Kos Island	50
Petroleum, refined	42-gallon barrels per day	Hellenic Aspropyrgos Refinery S.A.	Aspropyrgos	95,000
Do.	do.	Motor Oil (Hellas) Corinth Refineries S.A.	Aghii Theodori, Corinth	140,000
Do.	do.	Petrola Hellas S.A.	Eleusis	100,000
Do.	do.	Thessaloniki Refining Co. A.E.	Thessaloniki	76,000
Pozzolan (Santorin earth)		Lava Mining & Quarrying Co. (Heracles General Cement Co. S.A.)	Quarries on Milos Island	350
Do.		Titan Cement Co. S.A.	Do.	300
Steel, crude		Halyvourgia Thessalias S.A. (Manassis Bros. and Voyatzis S.A., 65%; National Investment Bank for Industrial Development, 35%)	Steelworks at Volos	1,500
Do.		Halyvourgiki, Inc.	Steelworks at Eleusis	1,200
Do.		Sidenor S.A. (also known as Halivourgia Voriou Ellados S.A.)	Steelworks at Volos	600
Do.		Do.	Steelworks in Magnesia	350
Zeolite		Silver & Baryte Mining Co. S.A. (Eliopoulos-Kyriacopoulos Group)	Mine at Pendalofos; plant at Ritsona	100
Zinc, mine, Zn in concentrate		TVX Hellas S.A. (TVX Gold Inc., Canada)	Kassandra Mines (Olympias, Stratoni), northeastern Chalkidiki	25